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For: EFFICIENT JOINT EQUALIZATION/DECODING METHOD  
AND APPARATUS FOR COMPLEMENTARY-CODE-KEYING  
BASED SYSTEMS

1 1. A Fast Walsh Transform bias cancellation system, comprising:  
2 a bias generator system having a plurality of inputs responsive only to feedback  
3 filter coefficients  $f_1, f_3, f_5$  and  $f_7$ , said bias generator generating, based upon said feedback  
4 filter coefficients, a plurality of output signals corresponding to the bias from a Fast Walsh  
5 Transform system for cancelling said bias.

1 2. The Fast Walsh Transform bias cancellation system of claim 1, further including a  
2 feedback filter coefficient generator for generating feedback filter coefficients.

1 3. The Fast Walsh Transform bias cancellation system of claim 1, in which the bias  
2 generator has a plurality of outputs each having a signal thereon, the bias generator output  
3 signals being defined by the equation:

4 
$$B_k = (-f_1\Phi_2 + f_3\Phi_2^*)a_{0,\lfloor k/4 \rfloor}b_{\lfloor k/4 \rfloor,k}^* + (2f_3\Phi_2 + 2f_5\Phi_2^*)b_{\lfloor k/4 \rfloor,k}^*$$
  
5 
$$+ (-f_5\Phi_2 + f_7\Phi_2^*)a_{0,\lfloor k/4 \rfloor}b_{\lfloor k/4 \rfloor,k}^*$$

1        4.        A Fast Walsh Transform bias cancellation system, comprising:  
2                a bias coefficient generator responsive to feedback filter coefficients and having a  
3        plurality of outputs, said bias coefficient generator configured to calculate bias generator  
4        inputs; and  
5                a bias generator responsive to the bias coefficient generator outputs and having  
6        signals on its outputs corresponding to the bias from a Fast Walsh Transform system, said  
7        bias generator including:  
8                a plurality of adders each having an input and an output coupled to one of  
9        the bias generator outputs; and  
10               a plurality of complex multipliers each coupled between each adder input and each  
11        bias coefficient generator output.

1        5.        The Fast Walsh Transform bias cancellation system of claim 4, in which the bias  
2        coefficient generator has three outputs each having a signal thereon, the generator output  
3        signals being defined by the respective equations:

$$D_0 = -f_1\Phi_2 + f_3\Phi_2^*$$

$$D_1 = 2f_3\Phi_2 + 2f_5\Phi_2^*$$

$$D_2 = -f_5\Phi_2 + f_7\Phi_2^*$$

1        6.        The Fast Walsh Transform bias cancellation system of claim 5, in which the bias  
2        generator has sixteen outputs each having a signal thereon, the bias generator output signals  
3        being defined by the equation:  $B_k = D_0 a_{0, \lfloor k/4 \rfloor} b_{\lfloor k/4 \rfloor, k}^* + D_1 b_{\lfloor k/4 \rfloor, k}^* + D_2 a_{0, \lfloor k/4 \rfloor}^* b_{\lfloor k/4 \rfloor, k}^*$

1        7.        The Fast Walsh Transform bias cancellation system of claim 4, in which the first set  
2        of complex multipliers includes three complex multipliers, the plurality of adders includes  
3        eight adders, the second set of complex multipliers includes sixteen complex multipliers  
4        and the bias generator includes sixteen outputs.

1        8.        The Fast Walsh Transform bias cancellation system of claim 4, in which the bias  
2        coefficient generator is responsive to the feedback filter coefficients consisting of  $f_1$ ,  $f_3$ ,  $f_5$ ,  
3        and  $f_7$ .

1        9.        The Fast Walsh Transform bias cancellation system of claim 4, in which the bias  
2        coefficient generator is further responsive to a Fast Walsh Transform parameter that  
3        indicates the quadriphase rotation.

1        10.        The Fast Walsh Transform bias cancellation system of claim 9, further including the  
2        Fast Walsh Transform system.



1        13.     The Fast Walsh Transform bias cancellation system of claim 12, in which the  
2        outputs of the bias generator has sixteen outputs each having a signal thereon, the bias  
3        generator output signals being defined by the equation:

4        
$$B_k = D_0 a_{0, \lfloor k/4 \rfloor} b_{\lfloor k/4 \rfloor, k}^* + D_1 b_{\lfloor k/4 \rfloor, k}^* + D_2 a_{0, \lfloor k/4 \rfloor} b_{\lfloor k/4 \rfloor, k}^*.$$

1        14.     The Fast Walsh Transform bias cancellation system of claim 11, in which the first  
2        set of complex multipliers includes three complex multipliers, the plurality of adders  
3        includes eight adders, the second set of complex multipliers includes sixteen complex  
4        multipliers and the bias generator includes sixteen outputs.

1        15.     The Fast Walsh Transform bias cancellation system of claim 11, in which the bias  
2        coefficient generator is responsive to the feedback filter coefficients consisting of  $f_1, f_3, f_5,$   
3        and  $f_7$ .

1        16.     The Fast Walsh Transform bias cancellation system of claim 11, in which the bias  
2        coefficient generator is further responsive to a Fast Walsh Transform parameter selected  
3        from the group of  $\phi_2$  selected from the group of 1, -1, j and -j.

1        17.     The Fast Walsh Transform bias cancellation system of claim 11, further including  
2        the Fast Walsh Transform system.

1        18.    A Fast Walsh Transform bias cancellation system, comprising:  
2            a Fast Walsh Transform system having a plurality of outputs;  
3            means for generating the bias of the Fast Walsh Transform system;  
4            means for cancelling the bias from said Fast Walsh Transform system responsive  
5        to said Fast Walsh Transform system outputs and said means for generating the bias of a  
6        Fast Walsh Transform system.

1        19.     A method for cancelling the bias from a Fast Walsh Transform system, the  
2        method comprising the steps of:  
3                generating the bias from a Fast Walsh Transform system responsive only to  
4        feedback filter coefficients  $f_1$ ,  $f_3$ ,  $f_5$  and  $f_7$ ; and  
5                cancelling the bias of said Fast Walsh Transform system using the generated bias  
6        of the Fast Walsh Transform system.